DOCUMENT RESUME

ED 298 929 IR 013 314

AUTHOR Silber, Kenneth H.
TITLE Training Instructional Developers: A Review of Current Practice and Directions for the Future.
PUB DATE 84
NOTE 25p.; In: Instructional Development: The State of the Art, II; see IR 013 273. For volume I, see ED 292 444.
PUB TYPE Information Analyses (070) -- Viewpoints (120)

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS *Cognitive Processes; Graduate Study; Higher Education; *Instructional Development; *Professional Education; *Professional Recognition; *Skill Analysis; *Skill Development; Training

ABSTRACT

This chapter considers the professional status of instructional developers, the skills they need, and how those skills should be taught. Three differing approaches are discussed and critiqued: the specific skills approach; an approach which advocates the addition of "higher level" skills to the list of specific skills; and an "underlying skills" approach. The underlying skills approach assumes that the internal thinking processes or cognitive strategies a developer uses to guide instructional development (ID) efforts are the most important skills. It is concluded that all three approaches should be incorporated into ID training, but that the underlying skills approach represents an important addition to the field. The text is supplemented by three figure and four tables. (27 references) (Author/EW)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)
This document has been reproduced as received from the person or organization originating it.
Minor changes have been made to improve reproduction quality.
Points of view or opinions stated in this document do not necessarily represent official OERI position or policy.

ED298929

A. PREPARATION OF DEVELOPERS

Chapter 41

Training Instructional Developers: A Review of Current Practice and Directions for the Future

Kenneth H. Silber

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY
Charles Dills
TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

Are we a profession, and if not, how can we become one? What criteria must we meet? And how can we best train (or select to be trained) members of that profession? What is the relationship between psychological theory and ID training programs? The following chapter addresses these questions and provides answers which are both thought-provoking and which provide grounds for further research.

INTRODUCTION

Ever since the pioneering article "Would You Believe an Instructional Developer?" (Faris, 1968) we have been struggling to prove to ourselves, and to those we work with, that instructional development is indeed a profession.

To do this, we must first know what the characteristics of a profession are. Finn (1953) gave this answer:

> A profession has, at least, these characteristics: (a) an intellectual technique, (b) an application of that technique to the practical affairs of man, (c) a period of long training necessary before entering into the profession, (d) an association of the members of the profession into a closely knit group with a high quality of communication among members, (e) a series of standards and a statement of ethics which is enforced, and (f) an organized body of intellectual theory constantly expanding by research. (Finn, 1953).

Four additional criteria were added by writers over the next 21 years:

(g) the ability to exercise its own leadership (Finn, 1960);
(h) professional concern for responsible use of its work (AECT, 1972);
(i) an established relationship with other professions (AECT, 1972);
(j) acknowledgement as a profession (Silber, 1974).

Based upon these criteria, is instructional development a profession? Silber (1977, 1980) evaluates ID in terms of each of these criteria, and concludes that, while ID is on its way to becoming a profession, it has not become one yet.

One of the major areas in which he believes ID has yet to mature--and the area that is relevant to this paper--is that of training instructional developers.

Training as a Problem for Instructional Development

In discussing the professional status of the entire audiovisual field in 1953, Finn concluded:

> The test of a high degree of

IR013314

BEST COPY AVAILABLE

> professionalization of the audio visual field, however, breaks down completely against the third criterion--a long period of training for members of the profession. Most professions not only require this long period of training but are also **in substantial agreement as to the nature of this training...** The nature and content of professional education for audiovisual directors and other workers present many problems that must be solved.... Obviously, a graduate program that can provide the competencies generated by service and industrial experience coupled with a better theoretical background is required immediately. (Finn, 1953, boldface added)

Assessing the situation specifically for instructional development 24 years later, Silber (1977) found that "there is little agreement on what constitutes appropriate competencies, instructional strategies, and learning resources" for training instructional developers. Four years later, he found only four articles dealing with training instructional developers (Hendrix and Tiemann, 1971; AECT, 1974; Patridge and Tennyson, 1978-79; and DID, 1980). Gayeski (1981) received several listings of competencies required for trainers/HRD specialists, but did not discuss training implications of the competencies. If we add to this the five-article symposium on training instructional developers presented at the 1980 AERA Convention, and published in the Journal of Instructional Development (Vol. 4, No. 3, Spring 1981), we still find a paucity of literature dealing with training.

Summarizing the sad state of ID training, and proposing a direction for the ID field to take, Silber (1980) states:

> It **does not understand** the process of training instructional developers like it understands the processes of doing it. More importantly, **it does not know** that it is not training as well as it should be, and certainly has no idea **what is needed to improve itself....**the field of ID must undertake **systematic data-based analyses of (a) what makes a"good" instructional developer, (b) what skills and competencies do they need to possess to be "good" and (c) what kind of training/educational program can best help people gain those skills and competencies they need to be good.** (Silber, 1980, boldface as in original)

Purpose of this Paper

While there are currently no data-based analyses available, there is information about the characteristics of current ID training programs and the proposed competencies for ID Certification. In addition, there is a body of theoretical literature which suggests new and different competencies for ID'ers and thus new focuses for ID training programs.

This paper, then, will try to answer three questions related to those points identified above:

1. what skills are needed by a successful instructional developer?
2. can those skills be taught to prospective instructional developers?
3. if the skills can be taught, what are the best instructional strategies and resources for doing so?

It will address these questions within the context of answers provided by those advocating three different positions on the subject: (a) those advocating "specific ID skills;" (b) those advocating the addition of some "higher-level" skills to the list of specific skills; and (c) those advocating an "underlying skills" approach.

SPECIFIC ID SKILLS APPROACHES

"Specific ID skill" approaches are those which advocate that the training an instructional developer receives ought to consist of the set of specific ID skills the developer will be performing in any instructional development job (such as performing needs assessments, conducting task analyses, interacting with subject-matter experts, and evaluating instructional systems), and of the theory and knowledge underlying these specific skills.

Skills Needed

In this approach, the needed skills are identified by conducting a job or task analysis of what the instructional developer actually does when performing ID. This is usually done in several different settings (e.g., higher education, business and industry, military and government) to allow for situational differences. These analyses are then converted into lists of competency statements, and, sometimes, into behavioral objectives. Published examples of such competency lists can be found in Faris (1968), Hendrix and Tiemann (1971), AECT (1974), and DID (1980).

A comparison of the earliest with the most recent competency lists for instructional developers is shown in Table 41-1.

By looking at the DID (1980) list alone, and by comparing it with the Faris (1968) list, we can note the following:

1. The DID list seems to be a fairly complete one; it covers all the components of the ID process, including front-end and rear-end analyses,

Table 41-1.

Competencies for instructional developers--early and new (from Faris, 1968, p. 972 and DID, 1980, pp. 27-30).

Faris (1968)	DID (1980)
Application of System Design Concepts to Instructional Development	Select Appropriate Projects for ID
Analysis of Learners	Conduct Needs Assessment
Specification and Evaluation of Education Objectives	Assess Learner/Trainee Characteristics
Analysis and Sequencing of Tasks	Analyze Structural Characteristics of a Job, Task, and/or Content
Conceptualization and Application of Instructional Strategies	Write Statements of Learner Outcomes
Production of Stimulus Materials	Analyze the Setting Characteristics
Application of Adoption Strategies	Sequence Learner Outcomes
Conduct and/or Guide Research and Development Projects	Specify Instructional Strategies
	Sequence Instructional Activities
	Select Learning Resources
	Create the Specifications for Instructional Activities
	Seek Extant Instructional Materials
	Prepare Specifications for To-Be-Produced Materials
	Evaluate Instruction/Training
	Establish a Course/Training Package/ Workshop Management System
	Develop an Instructional Development Project Plan
	Monitor Instructional Development Projects
	Communicate Orally and In Writing According to Accepted Societal and Professional Standards
	Use Appropriate Consulting Skills
	Use Appropriate Group-Process Skills
	Encourage the Diffusion and Adoption of Instructional Development
	Engage in Professional Activities

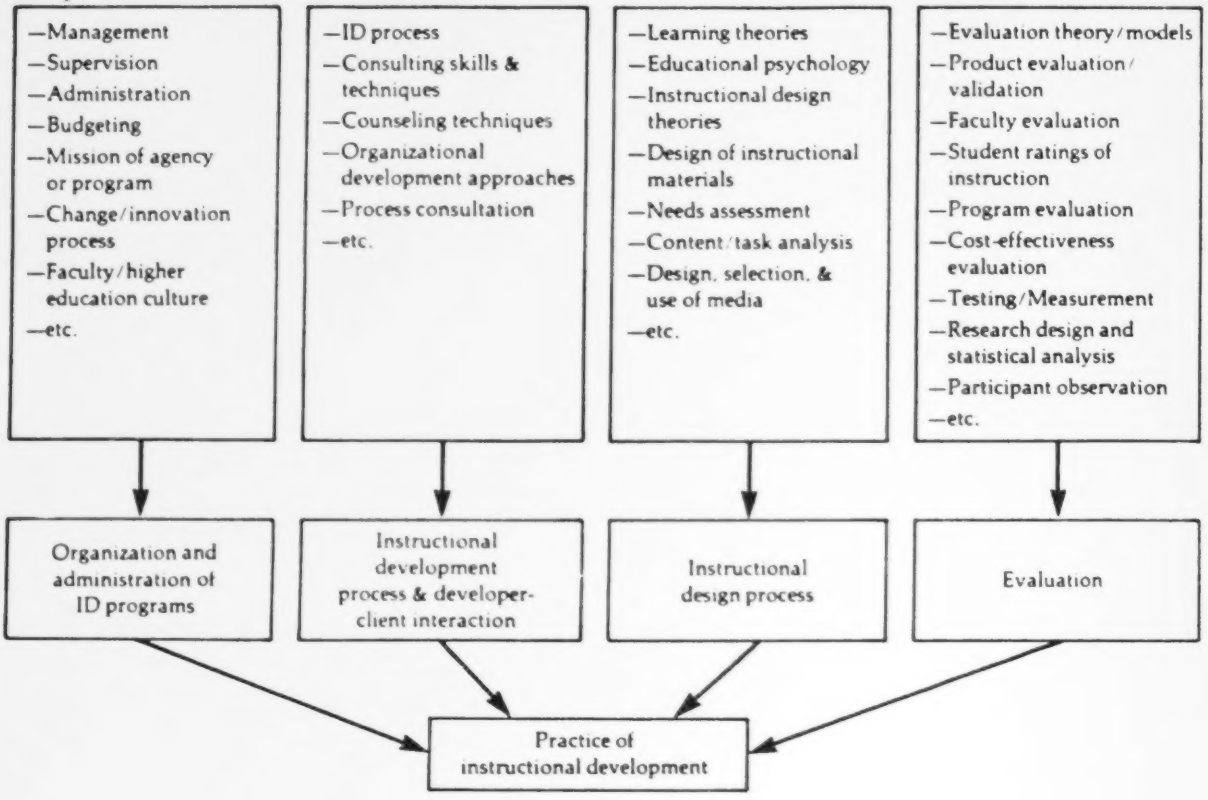


Figure 41-1. Scope of the knowledge base for the activities of instructional development in higher education.

as well as all the support mechanisms (e.g., management, interpersonal skills, diffusion and adoption) needed to make ID an ongoing activity;

2. Faris' early list is very similar to the current DID one; while the DID list adds additional front-end analysis and evaluation and consulting skills, and makes more specific many of Faris' competencies, it has made no earthshaking additions to, or quantum leaps beyond, the list of skills generated 12 years earlier;

3. The skills given in both lists are "specific skills needed to perform instructional development," and make no reference to either (a) how these ID skills are similar to skills used in other professions, or (b) the existence of any underlying skills or abilities which might enable one to perform, or better perform, the specific skills.

These specific skills have been grouped into four areas by Durzo, et al., (1979) based upon clusters of similar skills. The four clusters, and the specific skills found in each, are shown in Figure 41-1. While this clustering helps to group similar specific skills together, it still serves to provide a listing of only the specific skills involved in the practice of instructional development.

Training Programs

Specific-skills approaches skip the question "Can these skills be taught?" and move directly to the question of how best to organize a curriculum to teach them.

How these specific skills, and the knowledge underlying them, are included in, and ranked in terms of importance by, institutions which train instructional developers is best shown in the selective study of nine institutions by Patridge and Tennyson (1978-79). Faculty members from each of these institutions were asked to rank ID and related competencies in terms of the emphasis they received in the master's and doctoral degree programs at each institution. The results from six of these programs are shown in Table 41-2.

Table 41-2. Ranking of Student Competencies in an Ideal Program.

Institution	Masters	Doctorate
Brigham Young U.	1-Development of a curriculum. 2-Experimental design. 3-Theories of instruction. 4-Theories of learning. 5-The management of programs and personnel. 6-The administration of programs and personnel. 7-The use of media equipment: video. 8-The use of media equipment: visual (photographic, graphics). 9-Course evaluation. 10-Program evaluation.	1-Development of a unit (course or program) of instruction. 2-Development of a curriculum. 3-Product evaluation. 4-Course evaluation. 5-Evaluation of media materials. 6-Program evaluation. 7-Design of media hardware/facilities. 8-Data analysis. 9-Theories of instruction. 10 Experimental design.
Florida State U.	1-Development of a unit (course or program) of instruction. 2-Development of a curriculum 3-Test and measurement techniques. 4-Theories of learning 5-Theories of instruction. 6-Product evaluation. 7-Program evaluation. 8-Course evaluation. 9-Evaluation of media materials. 10-Use of computers.	1-(Other) Needs assessment/analysis. 2-(Other) Design of instructional systems. 3-Development of a unit (course or program) of instruction. 4-Theories of learning. 5-Program evaluation. 6-Development of a curriculum. 7-Product evaluation. 8-Evaluation of media materials. 9-Theories of instruction. 10-Course evaluation.
Indiana University	1-Development of a curriculum. 2-Development of a unit (course or program of instruction). 3-The use of media equipment: visual. 4-Evaluation of media materials. 5-Production of media materials: visual. 6-The management of media resources. 7-The management of programs and personnel. 8-The administration of programs and personnel. 9-Design of media hardware/facilities. 10-Product evaluation.	1-Development of a curriculum. 2-Development of a unit (course or program) of instruction. 3-The use of media equipment: visual. 4-Production of media materials: visual. 5-Theories of instruction. 6-Evaluation of media materials. 7-The management of media resources. 8-The management of programs and personnel. 9-Product evaluation. 10-The administration of programs and personnel.

Over all, the data from this study show that most programs ranked the specific skills and knowledge in the following order:

1. Development of a unit/course/program of instruction
2. Theories of learning and instruction
3. Evaluation of products/programs/courses/media
4. Management of programs and personnel
5. Production and management of media materials

With the notable exceptions of skills relating to interpersonal and group process consulting and to the encouragement of diffusion and adoption of ID, the emphases in these ID training programs matches fairly closely the lists of competencies for instructional developers shown in Table 41-1.

How these specific ID skills, and their relative emphases, are combined into a curriculum for ID students is best illustrated by the Instructional Design, Development and Evaluation program at Syracuse University. This program "is now completing a twenty-four month self-assessment which includes reviews of training and educational needs, curriculum analysis, and critiques by graduates in the field." (Durzo and Doughty, 1981)

The process followed by Syracuse is unique in that the practicing instructional developers at the Center for Instructional Development worked with the IDD & E Department faculty members as they

Table 41-2. (continued)

Institution	Masters	Doctorate
Syracuse U.	1-Experimental design. 2-Theories of learning. 3-Test and measurement techniques. 4-Data analysis. 5-Theories of instruction. 6-Program evaluation. 7-The management of programs and personnel. 8-Development of a curriculum. 9-Course evaluation. 10-Production of media materials.	1-Experimental design. 2-Theories of learning. 3-Test and measurement techniques. 4-Data analysis. 5-Theories of instruction. 6-Program evaluation. 7-Course evaluation. 8-Product evaluation. 9-All others.
U. of Iowa	1-Development of a unit (course or program) of instruction. 2-Evaluation of media materials. 3-Management of media resources. 4-Product evaluation. 5-Production of media materials: visual. 6-Production of media materials: video. 7-Production of media materials: audio. 8-Theories of instruction. 9-Test and measurement techniques. 10-The management of programs and personnel.	1-Development of a curriculum. 2-Theories of instruction. 3-Program evaluation. 4-Experimental design. 5-Course evaluation. 6-Administration of programs and personnel. 7-Development of a unit (course or program) of instruction. 8-Evaluation of media materials. 9-Data analysis. 10-Theories of learning.
U. of Minnesota	1-Development of a unit (course or program) of instruction. 2-Theories of instruction. 3-Product evaluation. 4-Program evaluation. 5-Development of a curriculum. 6-Theories of learning. 7-Course evaluation. 8-Evaluation of media materials. 9-Test and measurement techniques. 10-Management of media resources.	1-Theories of instruction. 2-Theories of learning. 3-Data analysis. 4-Experimental design. 5-Test and measurement techniques. 6-Product evaluation. 7-Program evaluation. 8-Course evaluation. 9-Development of a unit (course or program) of instruction. 10-Development of a curriculum.

would have with those from any other department--thus applying the "ID approach" to the redesign of the program. This is the first documented case of an ID department practicing what it preaches in its curriculum and course design.

The curriculum of the Syracuse IDD & E department is shown in Figure 41-2.

By looking at the curriculum alone, and by comparing it to the specific ID skills (Table 41-1), the grouping of these skills (Figure 41-1), and the rankings of these groupings (Table 41-2), one can conclude that:

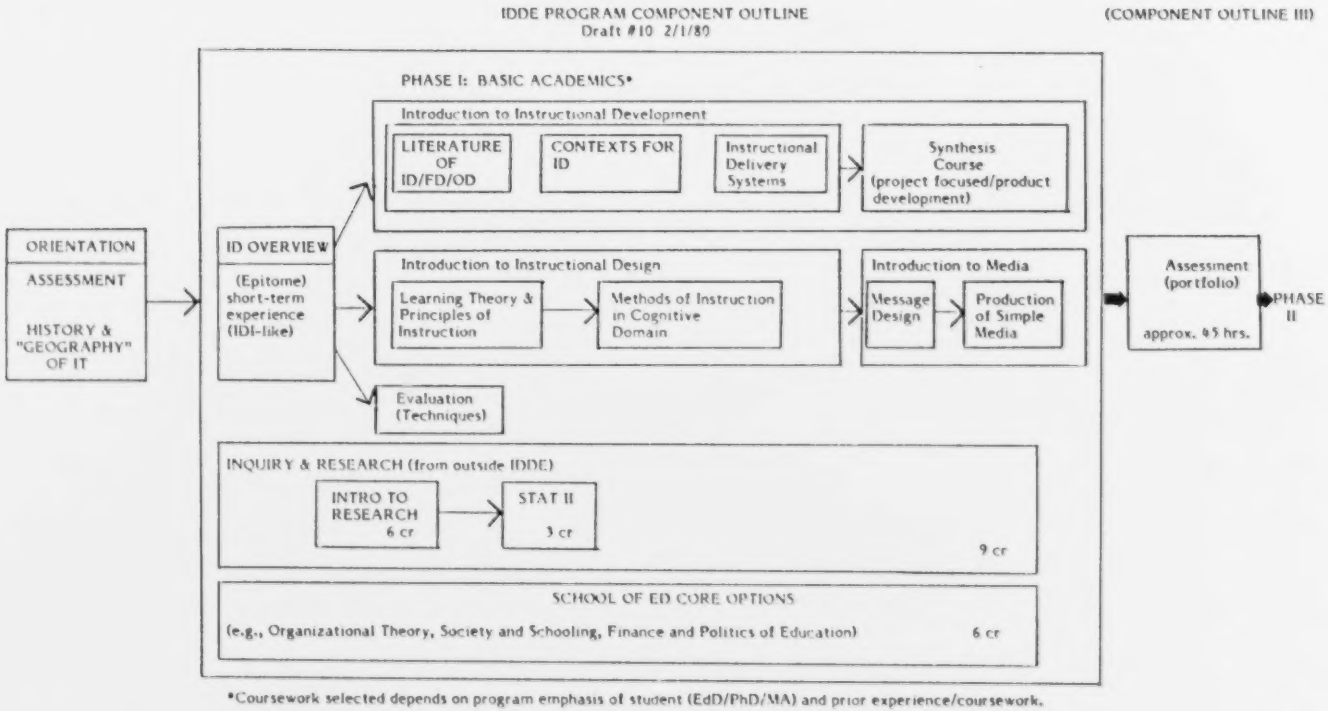
1. The curriculum includes all the specific ID skills, groups them according to the identified areas, and emphasizes the most important areas and skills.
2. The curriculum seems to have breadth, depth, and appropriate sequencing in its course offerings.

Critique of Specific Skills Approaches

While the approach using the "specific ID skills" as the basis for training instructional developers produces an internally consistent curriculum--with courses matching competencies which match on-the-job tasks--the author believes there are several problems with using specific skills as the **sole basis** for training.

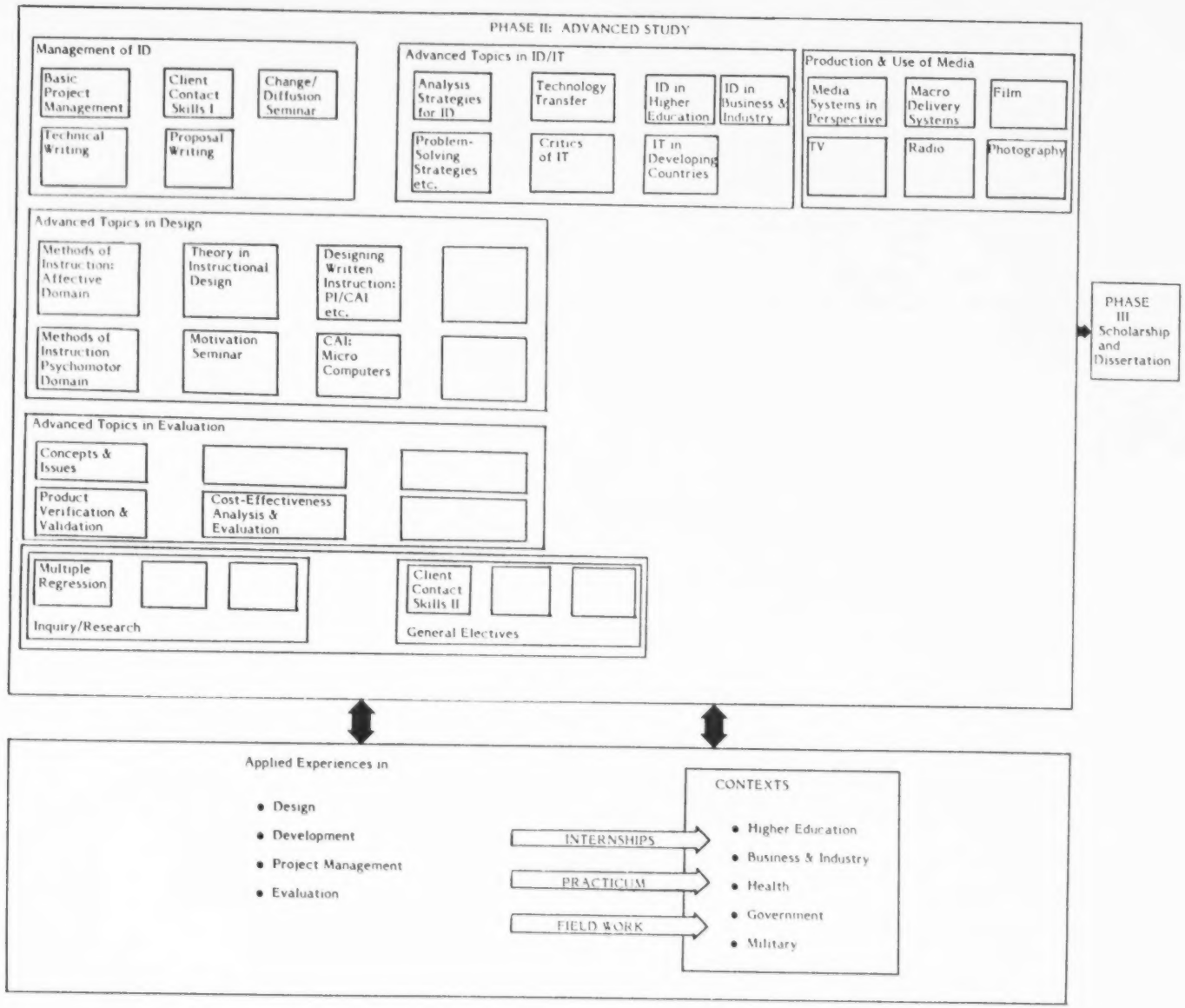
The first problem is that these approaches

Figure 41-2. IDDE curriculum overview. (Copyright 1981, Association for Educational Communications and Technology. Reprinted from the Journal of Instructional Development, 1981, Vol. 4, No. 3 with permission.)



*Coursework selected depends on program emphasis of student (EdD/PhD/MA) and prior experience/coursework.

Figure 41-2. (continued)



focus upon the overt activities of the developer, and ignore the consideration of any underlying mental processes which might be occurring within the developer while performing them. For example, they assume that given a range of techniques for analyzing the structural characteristics of a job or content (such as task analysis or content elaboration procedures), and information about the job or content, the developer will be able to draw a flow-chart of tasks involved in the job or identify the epitomes and levels of elaborations of the content.

They ignore, however, the internal mental processing the developer must go through in analyzing and restructuring the information in her/his head before the finished "task/content analysis" is produced--that is, the internal mental processes which make it possible for the developer to use the techniques in the first place.

Admittedly, since these mental processes are internal, and therefore not observable, they are difficult to identify. A "common sense" analysis of this internal mental process is, however, attempted by Silber (1981b), who suggests the following internal process:

a. The developer is presented with some **problem** related to learning and/or performance.
b. The developer must gather information about the problem, analyze it, synthesize it into some coherent statement, and evaluate this statement in terms of reality.
c. The developer is presented with a body of content related to the problem, usually in verbal written form, which s/he must learn or develop a cognitive structure for.
d. The developer must **analyze** that body of content and **restructure (or synthesize)** it into a form that takes into account both the integrity of the content and the learning and instructional principles to be applied to it.
e. The developer must **evaluate** the accuracy and adequacy of this restructuring, and **re-structure again** if the original attempt is not successful.
f. The developer must translate the verbal written form of the content into other communication formats, such as visual and oral media. (Silber, 1981b, boldface as in original)

If this analysis is correct--and Silber presents some theoretical approaches which support it (to be discussed later in this paper)--then the internal mental processes of the developer include: gathering, analyzing, learning, synthesizing, evaluating, re-structuring, and translating information.

If these internal mental processes exist, and if the developer must use them in order to perform the specific ID skills, then it is clear that there is a serious omission from the competency lists, and from the curricula used by those advocating specific-skills approaches. The lists and curricula contain no reference to these internal mental processes--either as course content, as instructional strategies, or as screening criteria which would ensure that developers had these mental processes so that they could apply the specific skills.

The second problem with specific-skill approaches is related to the first problem just discussed. These approaches **never address the question** "Can these skills be taught?"

As long as one assumes that the specific ID skills are the total repetoire of skills to be learned, one can argue that this is a moot question; the skills can be taught to most master's and doctoral level students--and we have been doing so in ID training programs for almost 15 years.

When one looks at the quality of the performance of the graduates of these ID programs, however, one may find that this claim of success needs to be tempered a bit.

The following contention should come as no surprise to anyone who has trained, employed, or worked as an instructional developer (though the author is the first to admit that there is no hard evidence to support it):

Not all graduates of ID training programs attain the same grades in ID courses, receive equally laudatory recommendations from faculty members, seem equally qualified to prospective employers during interviews, and receive equally positive on-the-job performance evaluations.

Some may argue that this contention is not supported by research, and is therefore meaningless--or is even not true; some may argue that it is so obvious and trivial that it is not even worth pointing out; some may argue that it is true, but can easily be explained through the phenomenon of "individual differences," and therefore tells us nothing.

The author believes, however, that these arguments of meaninglessness only apply within the context of the "specific skills" approaches to ID training. When one looks beyond them, the differences in performance-level take on great significance.

Could it be that the individual differences found in the ability to learn and perform the specific ID skills are related **not to the specific skills themselves, but rather to some set of underlying mental processes** which enable one to apply the specific skills--perhaps the mental processes listed above?

Could it be that one must be able to use, or learn to use, these mental processes in order to successfully learn and apply the specific ID skills--and that without these mental processes, one cannot learn and perform the specific ID skills at an optimal level?

Whether "yes" is the answer to these questions (as this paper will attempt to demonstrate in a later section) or not, the author believes that they are questions well worth asking. The fact that specific-skills approaches ignore them, and do not address the question "Can the skills be

taught?" seems to be a second serious omission on the part of those advocating these approaches to training.

A third and final problem with the specific-skills approaches is their inability to prescribe the instructional strategies and learning activities to be used in the courses in their curricula (a fault of the curriculum, for example, which is proposed in Figure 41-2).

Ideally, such programs would be designed through the use of the ID process they teach; their designers would systematically sequence the content, select instructional strategies, media and techniques, and employ principles from a theoretically-based science of instruction derived from the structure of the content being taught and the characteristics of the learner population.

In reality, sad to say, this is not the case. Most ID trainers will admit privately--though not for citation in a paper such as this--that they either use one of the "major texts in the field" (such as Gagne and Briggs, 1979) supplemented by lectures and projects, or use a commercially-produced or locally-developed self-instructional package. Further, they privately admit that this selection is made **not** through the systematic approach they advocate, **but rather** by trainer preference for either the content included in the materials or for the instructional strategy employed.

This point is made not to criticize ID trainers--the author is as guilty of this approach as is anyone else--but to emphasize another problem with the specific-skills approach.

Could it be that the teaching of specific ID-skills suggests no inherently superior instructional strategy?

Further, could it be that if one attempted to address underlying mental processes one would find a much clearer direction to follow in the selection of instructional strategies and learning activities?

While the author will attempt to answer the second question in the affirmative later in this chapter, at this point it seems sufficient to say that the omission of the discussion of instructional strategies and learning activities is a third weakness in the "specific-skills approaches" to training instructional developers.

In summary, then, while specific-skills approaches provide an internally consistent curriculum for training instructional developers, there are three problems with such approaches: (a) they ignore the consideration of underlying mental processes; (b) they do not address the question "Can the skills be taught?" (c) they do not indicate which instructional strategies and learning activities would most effectively teach the skills.

HIGHER-LEVEL SKILLS APPROACHES

"Higher-level skills" approaches are those which are based upon the assumption that the instructional developer ought to use conceptualizing and creative skills, rather than mere "rule-using" skills, in performing ID, and that training programs ought to include experiences which help students to develop these abilities.

Skills Needed

The two higher-level skills addressed in the literature are (1) comprehending the content of the discipline in which the developer is working (Bratton, 1981), and (2) working at the "creating" rather than at the "rule-using" level while doing design (Markle, 1981). Both of these higher-level skills, it should be noted, are parts of the internal thought-process underlying ID, described earlier in this paper.

Comprehending Content. In the performance of their jobs, instructional developers frequently work with subject matter which is unfamiliar to them. This is a matter of real concern to ID students and practitioners, as Bratton (1981) notes:

> Graduate students question their ability to work in content areas other than those with which they are already familiar, and practicing developers note the added effort placed on them when they must learn a new content area in order to help a client. (Bratton, 1981)

How does the developer go about learning an unfamiliar content area and developing a conceptual structure for it? According to the literature reviewed by Bratton, there is no general theme or organizational principle across the various fields of knowledge which would enable a developer to master some universal scheme, and then to quickly apply it, in order to understand new content areas.

Faced with this difficulty, Bratton points out that the skills needed by developers in order to learn about new subject matter are similar to the skills ethnographers use in order to learn about new cultures. He suggests that the interviewing techniques ethnographers use may be useful to instructional developers.

The strategy he proposes is based upon the use of three types of questions in discussing the content of an area with someone who is a subject-matter expert in it:

1. Descriptive questions--questions which are global in nature, and open-ended; they are designed to get the SME talking about the content, and are used to discover relevant follow-up questions.
2. Structural questions--questions which are more specific. These are used to gather detailed information about a particular topic and are used to test the developer's understanding of the content;
3. Contrast questions--questions which are more specific yet; these are directed at

> discovering the meaning of discrete facts and concepts and the relationships among them. (Bratton, 1981)

He suggests that the interview with the SME take the following format: "descriptive and structural questions are asked early and throughout the interview with the eventual interspersing of contrast questions." (Bratton, 1981)

Thus, one of the higher-level skills needed by the developer is a questioning technique designed to help the developer to learn about and develop a conceptual structure for new content.

Creating. The low level of behaviors required by most instructional systems reflects, according to Markle (1981), the relatively low level of thinking done by instructional developers during the ID process. In what she calls a "simplification over elaborate models," Markle suggests three levels of behavior: remembering; using; creating.

We are fixated on the rule-using level in most of the instruction we design (such as the use of the RULEG format), she maintains--even though the sophistication of the designs which would really be appropriate for such instruction is far beyond such simple formulas.

If the instruction we design is at the "rule using" level, what about the thinking behavior of the instructional developers themselves? Markle says:

> It strikes me that our real progress in instructional design has been in the increasing sophistication of the analysis processes required of designers. Designers are... operating squarely in the top row creating, even when the instruction they are to design is not at the forefront of the discipline. (Markle, 1981)

How do instructional developers show this "creating" skill, so that they can then apply it to the instruction they design? Markle suggests that the key to this problem lies in the use of problem-solving skills. To identify what the specific elements that make up problem solving are, she indicates that

> ...in research and in practical applications, there is an emphasis upon developing protocols of thinking processes--blow-by-blow descriptions of how the thinker is proceeding through the problem. (Markle, 1981)

Thus, a second higher-level skill needed by developers is the ability to operate at the "creating" rather than at the "rule-using" level in their design of instruction--a skill which can be described by developing protocols of the thinking processes the developer uses in solving a problem.

Training Programs

Advocates of the higher-level skills approaches do not yet seem able to answer the question "Can these skills be taught?"--though Markle indicates qualified success in teaching her students to train their students to think, implying that if these skills can be taught to the developer's students, they can also be taught to the developers.

In addressing the question of how to teach higher-level skills, Markle indicates that there

> ...are several rich lodes to be mined for anyone who wants to think about thinking, among them the Piagetian exercises from Renner's group (Renner et al., 1976), the Guilford-based series by Sampson (1975), the eclectic course materials from Whimby and Lochhead (1979), and the creativity exercises of Parnes (1967), as well as the brain twisters that research psychologists have been using for years. (Markle, 1981)

To train students to develop conceptual structures for new content, Bratton suggests four training opportunities:

1. Formal study in academic fields outside the area of ID and the College of Education...
2. Formal study and discussion of the task of working with unfamiliar content...
3. Formal practice in questioning and interviewing...
4. Internship experiences to observe ID practitioners on the job in SME interviews...(Bratton, 1981)

Critique of the Higher-Skills Approaches

Higher-level skills approaches take an important step beyond the specific-skills approaches by indicating that there are indeed skills that an instructional developer must possess other than those given in skill/competency lists.

They suggest that in order to "analyze the structure of a job, task, and/or content," the developer must construct in her/his own mind a conceptual structure of that subject matter, and must use some external questioning strategy, governed by some internal mental process, to do so. They also suggest that developers must operate at the "creating," rather than merely at the "rule-using" level implied by the specific-skills approaches, in order to design useful and relevant instruction, and that to do so an internal thinking-process which can be described through protocols is involved.

The problem, then, with higher-level skills approaches is **not** what they advocate, but rather with how far they take their ideas--both in theory and in applications for training.

While they identify the existence and importance of the higher-level skills required of a developer, they do not describe the nature of those skills in a precise way. Further, they do not indicate whether these are the **only** higher-level

skills required, or whether there might be others that are also important. Finally, these approaches do not link the internal mental processes they postulate to any theoretical model.

In terms of training for developers in the higher-level skills, these approaches do make some suggestions, but the suggestions are neither specific enough to be turned into curricula, instructional strategies or learning activities, nor are they approached in the systematic manner required in order to develop validated instruction.

In summary, then, higher-level skills approaches make a contribution by adding a missing dimension to the specific-skills approach, but the result is still insufficient because the advocates of the higher-level skills approaches do not go far enough in identifying the nature of the higher-level skills or of the training needed to master them.

UNDERLYING-SKILLS APPROACHES

"Underlying-skills approaches" are those which are based upon the assumption that the internal thinking-processes or cognitive strategies a developer uses to guide her/his ID efforts are the most important set of skills a developer must possess in order to be successful. S/he must possess these underlying skills in order to properly and appropriately exercise either the basic skills or the higher-level skills; and if s/he attempts to exercise these basic or higher-level skills in the absence of the underlying skills, s/he will do so only on the level of rule-following, probably poorly, and certainly not creatively.

The main thesis of the underlying-skills approaches, as stated by Silber, declares that:

> There is a basic set of **underlying skills** required of the instructional developer--skills which enable her/him to learn the specific ID skills in the first place, and to apply them successfully on the job. (Silber, 1981b)

Skills Needed

In underlying-skills approaches, the skills needed are identified in terms of the internal thought processes that take place while performing the ID process (as suggested above by Markle). They begin with the "common sense" of the internal mental processes as suggested by Silber earlier in this chapter, make them more specific and tie them to existing theoretical bases.

Wallington's Generic Skills. Deriving his list from the ID literature, Wallington (1981) identifies five generic skills:

1. interpersonal communication skills;
2. comfortably receiving and assimilating large amounts of new information; creating a logical structure for that information, and testing the information against that structure so that additional information can be assimilated; and seeking new information which will help to further develop the structure of the information--all of the foregoing done in conjunction with other persons as the source of information;
3. creative problem-solving of practical problems...;
4. the application of the behavioral sciences to instruction;
5. seeking and locating information from data bases and developing appropriate search strategies for each source of information--the foregoing done with information previously stored, usually in printed or test format....(Wallington, 1981)

It should be noted that the skills of receiving and assimilating new information and of creative problem-solving match the "higher-level skills" of Bratton and Markle discussed earlier, but Wallington's list increases the number of such skills. In addition, Wallington notes the importance of specific instructional-development skills.

Recognizing the need for further delineation of these generic skills, Wallington suggests two approaches to doing so. First, he notes that:

> If they are truly generic skills, they should be applicable in a variety of situations in instructional development. By analyzing those applications, a series of protocols can be developed to offer guidance for the practicing instructional developer....(Wallington, 1981)

Second, he indicates the need to go beyond ID frameworks. The three sources he proposes are: (a) the job analysis field; (b) models and taxonomies of learning psychology; and (c) Guilford's Structure-of-Intellect Model of human intelligence (based upon ideas presented in Silber, 1981b).

Wallington himself further delineates one of the generic skills--the ability to assimilate new information. Going beyond Bratton's ethnographer analogy, he relates this skill to the ability

> ...to take a standardized test (any subject) and do well, and/or to easily learn a new language, and/or to quickly learn a role or part (become a "quick study"). (Wallington, 1981)

The existence of these generic skills, he concludes, demonstrates that instructional development is more than a simple technical process--as conceptualized by "specific skills approaches"--and that practicing developers are more than technicians, because they use complex and pervasive internal thought-processes as the basis for their ID work.

Silber's Analysis, Based upon Gagne, Piaget and Guilford. Silber (1981b) attempted more

comprehensive identification of the internal thought-processes underlying ID, the delineation of their components, and the linking of them to theoretical models. Beginning with the "common-sense analysis" of the thought processes described earlier, and with Wallington's list of generic skills, Silber attempted to: (1) identify the nature of the underlying skills according to Gagne's types of capabilities; (2) delineate the nature of the underlying skills in terms of Piaget's stages of intellectual development; and (3) delineate the nature of the underlying skills in terms of Guilford's Structure-of-Intellect model.

1. **Nature of the Underlying Skills.** If one looks at the specific ID skills as separate entities, Silber argues, they can be seen, in terms of Gagne's types of capabilities, as Intellectual Skills:

> Intellectual skills are capabilities that make the human individual **competent.** They enable him to respond to conceptualizations of his environment...Learning an intellectual skill means learning **how to do something** of an intellectual sort. (Gagne and Briggs, 1979)

(Boldface as in original)

More specifically, applying the specific ID skills can be seen either as Rule-Using or as Problem-Solving Level Intellectual Skills--depending upon which of the levels earlier identified by Markle that the developer is working on.

However, when analyzing the underlying skills of ID--the internal thought-processes a developer uses--it is more correct and useful to view them as a Cognitive Strategy:

> ...a cognitive strategy is a **control process,** an internal process by means of which learners select and modify their ways of attending, learning, remembering, and thinking...A cognitive strategy is an **internally-organized** skill that selects and guides the internal processes involved in defining and solving novel problems...cognitive strategies have as their objects the learner's own thought processes. (Gagne and Briggs, 1979) (Boldface as in original)

The capabilities used in defining Cognitive Strategy, Silber concluded, describe the **internal thought-processes** which **underlie** and **control** the use of the specific ID skills.

While Gagne and Briggs assert that it is difficult to describe cognitive strategies, since they are internal processes, Silber believes that the particular strategy underlying and controlling ID can be described. Because the developer's thought processes begin when s/he is presented with a problem, and end when that problem is solved as described in the "common-sense" analysis presented earlier, the cognitive stratgegy can be described as an **internal problem-solving** process, and delineated through a problem-solving model.

It is important to note here (Wallington, 1980) that problem-solving as discussed here is **not** the Intellectual Skill, in which the process is applied to **external** situations. Rather, problem-solving here is an internal thought-process, used **internally** to **control** the developer's thought processes.

Based upon Guilford's (1967) endorsement of Rossman's (1931) set of problem-solving steps, and upon Guilford's ability to combine these steps with his Structure-of-Intellect categories in developing an operational model for problem-solving, Silber uses Rossman's steps to describe the internal problem-solving cognitive strategy. These steps are listed here:

1. Need or difficulty observed
2. Problem formulated
3. Available information surveyed
4. Solutions formulated
5. Solutions critically examined
6. New ideas formulated
7. New ideas tested and accepted

(Rossman, quoted in Guilford, 1967)

To summarize the discussion of the nature of the underlying skills, Silber proposed two theses:

1. There is an integral thought-and-control process--a Cognitive Strategy--which underlies the use of specific ID skills.
2. The Cognitive Strategy underlying ID is an internal problem-solving thought-and-control process. (Silber, 1981b)

With the nature of the underlying skills identified, Silber next moved to attempt to delineate the components, or subordinate skills, that make up the internal problem-solving thought-and-control process. He found two theoretical models through which this can be done.

1. **Delineation in terms of Piaget.** The first theoretical model which provides a framework for this delineation is that of Piaget's Stages of Intellectual Development. (Inhelder and Piaget, 1958).

A succinct and relevant comparison of the two stages that are related to the cognitive strategy under discussion is shown in Table 41-3 (Harmon and King, 1979).

Based upon the characteristics of Formal Operations, it is clear that **Formal Operations are components of, and required for, the internal problem-solving cognitive strategy underlying ID.**

Components of that cognitive strategy, according to the list Silber (1981b) derived from Harmon and King (1979), are:

- use of models
- use of relationships between two or more variables
- generation of hypotheses
- thinking in terms of abstract patterns, concepts, principles
- awareness of own reasoning

Table 41-3. Analysis of the instructional implications of the interaction between the concrete and formal aspects of information to be learned and the developmental level of the student.

Developmental Level of Students	Nature of information to be learned: CONCRETE INFORMATION	FORMAL INFORMATION
CONCRETE OPERATORS	NO PROBLEMS Use normal instructional techniques.* Theory should be confined to representational models or images.	PROBLEMS! Specific tasks should be reduced to the point where they can be solved by concrete operators. And since one shouldn't expect good retention, one should be prepared to aid the student during actual performance.
FORMAL OPERATORS	NO PROBLEMS Use normal instructional techniques.* Theory can be representational or abstract.	NO PROBLEMS Use normal instructional techniques.* Theory should be abstract or formal.

*These techniques may include job aids, but in these cases the job aids will not necessarily serve to reduce the complexity of the information on the job aid.

-- checking on validity of conclusions
-- identifying and abstracting a pattern that a particular problem typifies, and using the knowledge of that pattern to be systematic in solving the problem
-- predicting a number of different possibilities relative to a given situation
-- considering what actually exists at the moment, and what other possibilities are latent in the particular situation
-- coordinating two or more disparate referential systems.

Thus, Piaget's notion of Formal Operations not only supports the concept of a set of underlying skills, but also delineates what those skills are. This lead Silber to conclude that:

> The characteristics of Piaget's Formal Operational Thought provide a theoretically-based identification of the components of the internal problem-solving thought-and-control Cognitive Strategy underlying ID. (Silber, 1981b)

2. **Delineation in terms of Guilford.** The second theoretical model that provides a frame work for the delineation of the Cognitive Strategy is Guilford's (1967) Structure-of-Intellect (SI) Model.

The model, shown in Figure 41-3, considers 4 types of Content, 5 types of Operations performed on the content, and 6 Products that result.

In a key study applying the SI Model to problem-solving, Merrifield et al. (1962) hypothesized six abilities that make up problem-solving and related them to the cells in the SI Model. The abilities were to:

1. think rapidly of several attributes or characteristics of a given object
2. classify objects or ideas
3. find different relationships
4. think of alternative outcomes
5. think of attributes of a desired goal
6. deduce logically-sufficient antecedents

Parenthetically, it should be noted that these abilities are extremely similar to the characteristics of Formal Operational Thought identified above.

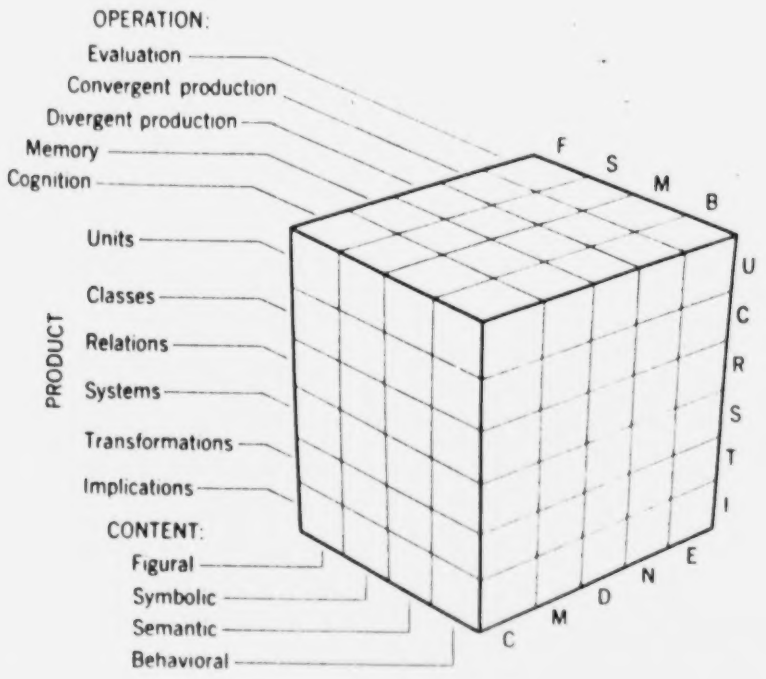


Figure 41-3.

Results of the Merrifield study showed that the six hypothesized problem-solving abilities "tested in this study can be explained in terms of factor dimensions that have logical positions in the structure-of-intellect." (Merrifield et al., 1962).

The 12 structure-of-intellect factors that make up problem-solving, as identified by this study, are listed below--by both the SI cell indicator and by the common name for the represented ability:

CMU - verbal comprehension
CMC - conceptual classification
CMR - awareness of conceptual relations
CMS - general reasoning
CMI - conceptual foresight
DMU - ideational fluency
DMR - associational fluency
DMT - originality/spontaneous flexibility
NMC - production of categories of meaning
NMR - production of conceptual correlates/relations
NMI - deduction
EMI - sensitivity to problems
(Merrifield et al., 1962)

Thus, Guilford's Structure-of-Intellect Model also supports the concept of underlying skills, and also delineates--in a different manner--what those skills are. This lead Silber to conclude that:

> Guilford's Structure-of-Intellect Model provides a theoretically-based identification of the 12 factors which make up the internal problem-solving thought-and-control cognitive strategy underlying ID. (Silber, 1981b)

Delimitations and Tests of Silber's Analyses. Despite their apparent logical soundness, Silber admits that his conclusions are merely hypotheses, and that there is no positive or negative evidence to suggest a relationship between the ability to conduct ID well and the possession of Piaget's Formal Operational Thought or Guilford's Problem-Solving SI factors. He also admits that the above analysis has some built-in limitations.

1. **Tests of the Theoretical Frameworks.** To support the validity of his ideas regarding the nature and delineation of the skills underlying ID, Silber reported the results of recently-completed pilot study, and suggested research needed in the future.

In the pilot study (Woodward, Silber, and Jahn, 1981), the relationship between possession of Formal Operational Thought and success in an instructional development course was studied. Possession of Formal Operational Thought was measured by the Test of Level of Thinking (TOLT;

developed by Tobin and Capie 1980a, 1980b) and shown to be both reliable and valid.

Results of the study showed that the score on the total TOLT--as well as upon the specific questions measuring "control of variables" and "combinatorial reasoning"--correlated .70 with (a) course grade, (b) conceptual grasp (as opposed to mere performance) of the ID process, and (c) a subjective rating of "ID competence" given by the instructor.

Silber claims that:

> These results indicate a strong relationship between the possession of Formal Operational Thought and both the ability to **do** instructional development well and the ability to **understand** what the ID process is and how and why it works. They support Theses 1 through 4--that is, there is an internal, problem-solving thought-and-control cognitive strategy underlying ID which is based upon the components of Piaget's Formal Operational Thought. Further, they suggest that possession of this cognitive strategy is necessary in order to apply the specific ID skills well. (Silber, 1981b)

Since these results come from a pilot study, and since no study has been done linking Guilford's SI factors to ID, Silber proposes that more-extensive and better-controlled studies be done to test the relationship of both of his theoretical formulations to ID, and to compare the two theories as delineations of the cognitive strategy underlying ID.

2. **Limitations of the Theoretical Frameworks.** The frameworks of Piaget and Guilford, and the studies reported to support them, do **not** address all possible underlying skills, according to Silber (1981b). While they address those skills underlying a major portion of the ID process--the cognitive processing of information in written and verbal forms--they **do not address** the skills underlying Wallington's (1981) "generic skill" of interpersonal communication, and in the area addressed by the literature on "visual literacy."

What is, and is not, addressed can best be understood in terms of the four types of content identified by Guilford: Semantic (words); symbolic (signs/codes); figural (images); behavioral (nonverbal, signs and signals conveyed through human interactions, feelings).

The Piaget and Guilford frameworks address only the semantic and symbolic types of content, thus omitting the remaining two content types which have great potential for use in the identification of underlying skills.

Silber recognizes the importance of behavioral content (for interacting with others) and figural content (for media production) in identifying the complete set of underlying skills. He suggests that when sufficient research and theory development has occurred with respect to these content types, an analysis similar to that outlined earlier for semantic and symbolic content can be attempted for these areas.

Summary. This extensive section on the skills needed by instructional developers according to "underlying skills approaches" has presented a description of the internal thought processes of the instructional developer from the point of view of Wallington's five "generic skills"; identified these thought processes as underlying skills in the form of a cognitive strategy; described that cognitive strategy as an internal problem-solving thought-and-control process; delineated the components of that internal problem-solving cognitive strategy in terms of characteristics and attributes of Piaget's Formal Operational Thought; delineated the components in terms of Guilford's Structure-of-Intellect Factors; reported a pilot study which supports the relationship between the possession of Formal Operational Thought and the ability to do and understand ID; proposed further needed research; and identified the limitations of the current underlying-skills analysis in terms of the type of content addressed.

Critique of the Underlying Skills Approaches

Due to the newness, the extensiveness, and the complicated nature of the "needed skills" identified by underlying-skills approaches, it seems appropriate to critique these approaches at this point and to present and critique suggestions for training developers in the use of these skills.

There seem to be four major strengths and three major weaknesses in the underlying-skills approaches to teaching the skills needed by the instructional developer. (The reader should note that the author is an advocate of, and one of the major writers about, this approach; thus, while he will try to be objective in this critique, some of his biases are bound to intrude themselves into this critique.)

The first strength is the degree to which advocates of underlying-skills approaches tie their analyses of needed skills to **theoretical frameworks.** In contrast to "specific skills" approaches--which are based upon competency lists developed from observations of what the developer does on the job--underlying-skills approaches are based upon theoretical frameworks which have been used and validated through research and application in fields outside of ID. Thus, while specific-skills approaches can provide only **internal validation** for their competency lists, the underlying-skills approaches seem to provide an **externally validated** set of skills which have been shown to have a wide range of applicability in other fields. The underlying skills identified, therefore, can be said to be based not only upon pragmatic analysis of what happens in ID (where the specific-skills approaches stop), but also upon theoretical frameworks which have been validated

outside the ID field, and upon skills, derived from those theories, which have been shown to exist in fields other than ID.

This conclusion leads to the second major strength. Based upon these theoretical frameworks, advocates of underlying-skills approaches seem to present a very **convincing argument** that underlying skills do exist, and present very **plausible delineations** of what these underlying skills are. It was noted in the critique of the specific-skills approaches that they seemed to ignore the internal mental processes that the developer had to use in order to perform the ID skills, and that such internal mental processes, based upon a "common sense" analysis, seemed to function in an important role in this performance. The theoretical work of Gagne, Piaget, and Guilford seems to clearly point to the existence and importance of underlying, internal mental processes which control and guide human cognitive activities. Further, despite the difficulty in describing processes which cannot be seen, the theoretical work of Piaget (Formal Operational Thought) and of Guilford (Structure-of-Intellect factors in problem-solving) provide clear delineations of what the components of those internal mental processes are.

Validation of their ideas through **research** is the third major strength shown by advocates of the underlying-skills approaches. Though the results come only from a pilot study, the .70 correlation between the possession of Formal Operational Thought and the ability to both do and understand ID is strong data-based evidence that underlying skills do exist and affect the ability to do ID.

Finally, the fourth major strength shown by advocates of underlying-skills approaches is their ability to explain the observation, noted earlier, that not all graduates of ID programs can perform ID equally well. While this point may seem meaningless when viewed in the light of specific skills, it takes on great significance when viewed in the light of underlying skills. It seems plausible to argue that the observed differences in performance of the specific ID skills result from varying degrees of the presence or absence of the underlying cognitive strategy. One may, for example, master the rules for performing a task analysis, but if one does not possess the cognitive strategy underlying ID, one may not know when to use those rules, or one may not be able to assimilate and restructure the associated content into a usable synthesis, or one may be unable to deal with the relationships among the information presented, the task/content analysis procedures, and the relations to be expressed by the finished synthesis. The possession of the underlying cognitive strategy may be the "individual difference" which explains varying levels of performance--and if it is, it is not a meaningless difference.

While the major weaknesses of the underlying-skills approaches are all acknowledged by those writing in the area, they are weaknesses nonetheless. The first major weakness is the lack of a delineation of those skills involved in the behavioral and figural content areas. "Developer-client interaction" is one of the four areas of ID skills identified by Durzo et al. (1979), and any practicing developer can attest to the importance of interpersonal or consulting skills in performing ID; but as a result of a lack of research and theory in this area, underlying-skills approaches have nothing to say about the cognitive strategy which underlies this behavioral content. Further, developers are frequently called upon to develop story-boards for mediated materials, and/or to evaluate already-produced mediated materials--a skill clearly involving figural content--but, again, underlying-skills approaches have nothing to say about the cognitive strategy underlying figural-related skills.

The second major weakness of the underlying-skills approaches is the insufficiency of the research evidence in support of its conclusions. Though the pilot study reported earlier does support the ideas presented, as indicated above, it still is only a pilot study conducted at one institution. In addition, the study relates the ability to do ID only to Piaget's framework; there is no research evidence at all connecting the Guilford framework with the ability to do ID. Clearly, more extensive research upon the relationships of **both** theories to ID is necessary in order to fully confirm the conclusions drawn.

Finally, the third major weakness is the presentation of two possible theoretical delineations of the cognitive strategy--one based upon Piaget and the other upon Guilford--and the lack of comparative evaluation of the utility of the two approaches. Must we use both frameworks to fully describe the cognitive strategy? Can we describe it using only one? If so, which one is more accurate? More useful? More useable? Silber (1981b) suggests some advantages and disadvantages to each approach, but he admits that these are personal views--not supported by research and probably not agreed upon by others. This presentation of two possible theoretical delineations, without drawing a conclusion about which to use, is likely to leave the potential user confused and without direction.

Over all, it seems that the strengths of the underlying-skills approaches greatly outweigh their weaknesses. Since the strengths lie within the areas of new insights, new theoretical bases, and new explanations of phenomena, they indicate that underlying-skills approaches are an important new approach to the identification of those skills an instructional developer must have in order to be successful.

The weaknesses, however, all fall within the category of "more work is needed," and can be remedied as more people begin to study the ideas inherent in these approaches.

TRAINING ACCORDING TO UNDERLYING SKILLS APPROACHES

Developing the underlying skills in instructional development students is not as simple a matter as it is in the case of the specific skills or the higher-level skills.

First, there is debate concerning whether or not these skills can, in fact, be taught at all - a question neither of the other two approaches has even addressed. Given the internal and complex nature of the underlying skills, this is indeed a valid and important question to be asked. Different answers emerge, however, from the analyses of the two major theories upon which this approach has so far been based.

Second, the prescriptions for training that do emerge resemble the ambiguous, general ones put forth by higher-level skills approaches more than they do the specific curricula put forth by the specific-skills approaches.

Can the Skills Be Taught

Many ID trainers will see this as a moot question. Since, according to Piaget, one reaches Formal Operational Thought at age 15, and since their students are older than that, they would argue, there is no need to teach the internal problem-solving thought-and-control cognitive strategy underlying ID at all--students already possess it.

Unfortunately, this is not the case, as studies cited by Harmon and King (1979) indicate:

> ... from 40 to 60 percent of sampled college students function at the concrete operational level....
>
> ... many adults (who function at the formal operational level with content with which they are familiar) function at the concrete level when they interact with tasks with which they are not familiar (Harmon and King, 1979)

This conclusion was borne out by the pilot study cited earlier (Woodward, Silber, and Jahn, 1981) in which only 67.5% of the students, with a mean age of 35, functioned at the formal operational level.

"Can the skills be taught?" is, then, a valid question which must be answered. After reviewing some weak but positive answers presented by Guilford (1967) and Gagne (1977), Silber (1981b) supports the **negative** conclusions reached by Harmon and King (1979) and Gagne (1977):

> Insofar as we can teach **formal operational thought**, suffice it to say that it takes a lot of time and effort and is only partially successful. (Harmon and King, 1979) At the same time,...it has not been easy to show that deliberate attempts to teach cognitive strategies result in consistent and substantial learning and transfer of learning. Regardless of the nearly universal agreement on the educational goal of "teaching students to think," the evidence that this goal can be successfully accomplished when deliberately undertaken is actually quite meager at present. (Gagne, 1977).

Silber thus concludes that "there is very little evidence at all that cognitive strategies [and formal operations] can be taught to adults." (Silber, 1981b)

Recognizing that Harmon and King's conclusion cited above, and another statement by Gagne (1977), involve the pragmatic element of time-to-teach as well as the theoretical element of teachability, Silber concludes that "if they **can** be taught to adults, it may require years of practice for them to learn and use a cognitive strategy." (Silber, 1981b)

Taking the opposite view, Wallington (1981) believes that it is theoretically possible to teach the formal operational cognitive strategy to adults if the proper instructional strategies are used. He suggests that formal operations must be taught to students by repeatedly having them solve problems which cannot be solved using concrete referents. He, too, cites Harmon and King (1979) on the procedure involved. To move from a concrete to a formal operational level

> involves overcoming inconsistencies and contradictions that are generated when a student seeks to apply her current repetoire of problem-solving strategies to tasks for which they are insufficient. Thus, to encourage a level change, developmentalists design situations that confuse the student. For a Piagetian, this confusion is a necessary part of the process by which a student reorganizes her/his basic cognitive structures to better deal with the demands of the tasks s/he is confronting. (Harmon and King, 1979)

Wallington believes that it is possible to build this instructional strategy into a training program, and thus move students from concrete-operational to the formal operational level--where they will possess the cognitive strategy underlying ID.

However, on the pragmatic issue of time and resources, Wallington concurs that it **may be impractical** to attempt to teach the required cognitive strategy within our training programs.

To conclude, it is safe to say that the answer to the question "Can the skills be taught?" is ambiguous on the theoretical level; on the pragmatic level the answer is, "It will take a lot of time and resources."

Training Program

If the underlying skills can be taught at all, how can we best go about it?

Gagne and Briggs (1979) explain that the teaching of cognitive strategies is different in nature from the teaching of intellectual skills. While with intellectual skills it is possible to plan a sequence of learning events external to the learner that provide the "sufficient conditions" for insuring the learning of those skills, the situation is more complex with cognitive strategies:

> ...the design of instruction for cognitive strategies has to be done in terms of "favorable conditions," and cannot be accomplished by specifying "sufficient conditions"... Generally, the favorable conditions are those which **provide opportunities for development and use** of cognitive strategies. (Gagne and Briggs, 1979)

Thus, according to Silber (1981b),

> ...if we are to attempt to teach cognitive strategies, it should be not with a course on "creative problem-solving," but rather by incorporating [into all courses that we teach] instructional strategies ...which demand that the student develop and use the problem-solving cognitive strategy underlying ID. (Silber, 1981b)

A more specific plan for teaching the cognitive strategy, in terms of Piaget's Formal Operational Thought, is proposed by Wallington (1981). His proposed instructional strategy is presented in Table 41-4.

It seems that Wallington's proposed incorporation of the instructional strategy into the curriculum provides the "favorable conditions" for the development of the cognitive strategy in students. Whether such an approach would work, and how it would affect the learning of the specific ID skills, are questions which can be answered only through future research.

Screening Students

Due to the ambiguity of the evidence on

Table 41-4. An instructional strategy for teaching formal operations in an ID Program (From Wallington, 1981).

-- over a long period of time, the courses should be structured so there is a progression from concrete operations to formal operations;

-- the skills learned in the courses should be arranged so that even if the content varies from cognitive to affective, or from fact to concept to problem-solving, every higher-level course should have some problem-solving built into it;

-- a program must have more to it than the learning of facts and procedures, because the cumulative effects of a number of concrete operations is **not** necessarily a move up to formal operations;

-- students making the move from concrete to formal operations levels must be given care, and their confusion must be resolved if such resolution is possible for them; **if it is not possible for them to move from concrete to formal operations, even more care and counseling is needed;** and it is the ethical obligation of the program to provide the student with such counseling;

-- all courses should be broken down into skills to be acquired, and these should be examined as to type and level of skill (by **someone's** consistent classification scheme) and then sequenced accordingly--this has special implications for courses outside the regular program.

whether or not the underlying skills can be taught, and to the pragmatic, if not theoretical, difficulty of teaching them if they can be taught, an alternative, but more radical, approach is suggested by Silber (1981b):

> If we cannot teach the internal problem-solving cognitive strategy that underlies ID, then we must use it as **a screening device.** We must only allow into graduate ID programs **those students who already use Formal Operational Thought and who possess the SI Problem-Solving abilities**--the cognitive strategy. (Silber, 1981b)

That such an approach may be an unpopular one is acknowledged by the proposer. He believes, however, that such an approach is better than graduating ID students who possess the specific ID skills but who do not use them well or appropriately because they lack the underlying cognitive strategy.

It should be noted that the use of screening mechanisms for graduate programs is not a new idea. Many institutions training developers currently use GRE and/or Miller Analogy Test scores, English proficiency tests, and undergraduate Grade Point Averages as screening devices. The addition of one more screen to these, or the replacement of the current screens by one which is more relevant to ID, is, in this context, not such a revolutionary idea.

Critique of Underlying-Skills Training Programs

It is difficult to critique a training program which (1) is ambiguous about whether the skills can be taught at all; (2) is based upon "favorable" rather than "sufficient" conditions for teaching the skills; and (3) offers screening as an alternative to training. However, several evaluative points can be made.

First, the underlying-skills approaches are the only ones to even raise the question, "Can the skills be taught?" This is an important question to be asked, regardless of which skills approaches are to be used. Not asking it assumes that everyone can learn to be an instructional developer. This seems to be a naive assumption, and one that is made in very few professional fields; doctors, physicists, clinical psychologists, linguists, and numerous other professionals assume that not everyone can learn the skills required to become a competent practitioner in their fields. Is instructional development so "simple" a field that anyone can learn to practice it well?

Second, the ambiguity--both theoretical and practical--about whether the cognitive strategy underlying ID can be taught to adults must be resolved. While the literature seems to point to the negative answer in both areas, there is still room for further research and a more definitive conclusion. An answer to this question will help in deciding whether efforts should be directed towards the improvement of teaching the skill, or towards its use as a screening device.

Third, the instructional strategy which has been proposed in order to create the "favorable conditions" for learning the underlying cognitive strategy is weak. From a logical point of view, it seems to be the appropriate, and only, way to attempt to teach the internal thought-and-control process underlying ID (at least as specified by Piaget's Formal Operational Thought). However, it needs to be tested in a controlled experimental situation in order to determine if it does indeed work.

Fourth, and finally, the notion of screening students based upon their possession of the cognitive strategy should not be written off as heretical or unethical. Based upon the number of screening mechanisms already used to admit students to ID programs, it is not such a radical idea. It, too, needs to be tested in an experimental situation. Another possibility is the use of test data indicating non-possession of the cognitive strategy as a counselling device--indicating to such students that they do not seem to possess the thought processes required of a developer and that they will probably have a difficult time in the ID field; they could then be permitted to decide for themselves whether or not they want to continue in the ID training program.

FUTURE DIRECTIONS FOR TRAINING DEVELOPERS

This chapter began by identifying the need for specifying the nature of ID training if ID is to become a profession, and by indicating the paucity of literature in the area of the training of developers. It reviewed the "specific ID skills" approaches, discussed their lists of competencies, and examined a typical graduate ID program based upon these specific skills. After indicating some shortcomings of this approach, the chapter briefly reviewed some attempts to add "higher-level skills" to the training of developers, including a discussion of what such skills are and how they might be taught. Noting that deficiencies exist in these approaches, the chapter then turned to the newest set of approaches to ID training--"underlying-skills approaches." It reviewed the nature of these underlying skills, as described by Wallington's "generic skills" and the "internal problem-solving thought-and-control process" suggested by Silber, and as delineated through Piaget's Formal Operational Thought and Guilford's Structure-of-Intellect Problem-Solving factors. Finally, the chapter presented the issues involved in teaching these underlying skills to prospective developers.

What implications for future directions in the training of instructional developers can be drawn from this review?

First, the specific ID skills are important, and must be learned by developers. The efforts involved in the development of a comprehensive, agreed-upon list of competencies, and in using

them as the basis for certifying developers, seems to be an important step in assuring that all developers receive adequate training for their profession. It will force improvement in training programs that do not now provide those learning experiences which are necessary for students to attain all the competencies. It will improve the status of ID as a field, and move it in the direction of becoming a profession. Finally, it will insure employers that, when they hire an instructional developer, they will indeed be hiring someone who can apply a set of procedures that--based upon the best knowledge available today--will produce effective instruction.

Second, the higher-level skills are essential for a practitioner to exercise in order to function as an effective developer. Training developers to operate at the "creating" rather than only at the "rule-using" level is crucial if they are to develop instruction which will teach students to create, rather than merely to remember or to use rules.

Third, the underlying-skills approaches present too powerful an idea to be ignored. With their strong founding in psychological theory, their generalizability over a large number of specific situations, their research support, and their delineation through at least two theoretical models, they represent a new, powerful, useful approach to viewing the skills needed by instructional developers.

The author believes that they represent an important quantum leap in the way we view the training of instructional developers, and, as such, they represent the future direction to be taken in the research, theory and practice pertaining to the training of developers.

Our energies as a field should be directed toward validating these underlying skills, exploring the relationships between the theoretical models which describe them and describe the components of the underlying skills as identified by these models. Efforts should be directed toward deciding whether or not these underlying skills can be taught, and if so, how. The notion of screening students based upon their possession of the underlying skills should be addressed.

Only if we can successfully train those who will come after us can the profession of instructional development succeed and prosper. The author believes that the best path towards the improvement of our training of future developers lies in the underlying-skills approaches. We need to answer the questions they pose, refine them into usable forms, and then implement them in ID training programs.

Doing so may cause those of us involved in the training of instructional developers to re-think and re-structure our graduate programs, but the results of this work--improved graduates--will make the effort well worth it.

REFERENCES

AECT. "The field of educational technology: a statement of definition." Audiovisual Instruction, Vol. 17, No. 8, October, 1972, pp. 36-43.

AECT. "Certification and accreditation." Audiovisual Instruction, Vol. 19, No. 9, November, 1974, entire issue.

Bratton, B. "Training the instructional development specialist to work in unfamiliar content areas." Journal of Instructional Development, Vol. 4, No. 3, Spring, 1981, 21-23.

DID. "Competencies for instructional development specialist." Instructional Innovator, Vol. 25, No. 9, December, 1980, pp. 27-30.

Durzo, J. and P.L. Doughty. "Redesign of a graduate program in instructional design, development, and evaluation (IDDE)." Journal of Instructional Development, Vol. 4, No. 3, Spring, 1981, pp. 14-21.

Durzo, J., R.M. Diamond and P.L. Doughty. "An analysis of research needs in instructional development." Journal of Instructional Development, Vol 2, No. 4, Summer, 1979, pp. 4-11.

Faris, G. "Would you believe an instructional developer?" Audiovisual Instruction, Vol. 13, No. 9, November, 1968, pp. 971-973.

Finn, J.D. "Professionalizing the audiovisual field." AV Communication Review, Vol. 1, No.1, Winter, 1953, pp. 6-17.

Finn, J.D. "Technological innovation in education." Audiovisual Instruction, Vol. 5, No. 7, September, 1960, pp. 222-226.

Gagne, R.M. Conditions of Learning, 3rd edition, New York: Holt, Rinehart and Winston, 1979.

Gagne, R.M. and L.J. Briggs. Principles of Instructional Design, 2nd Edition. New York: Holt, Rinehart and Winston, 1979.

Gayeski, Diane. "Educating the training professional." Training and Development Journal, Vol. 35, No. 8, August, 1981.

Guilford, J.P. The Nature of Human Intelligence. New York: McGraw-Hill, 1967.

Harmon, N.P. and D.R. King. "Operant learning, cognitive development, and job aids." Improving Human Performance Quarterly, Spring, 1979, Vol. 8, No. 1, pp. 1-28.

Hendrix, L. and P.W. Tiemann. "Design for designers." NSPI Journal. July, 1971, Vol. X, No. 6, pp. 11-13.

Inhelder, B. and J. Piaget. The Growth of Logical Thinking From Childhood to Adolescence. New York, Basic Books, 1958.

Markle, S.M. "Training designers to think about thinking." Journal of Instructional Development, Vol. 4, No. 3, Spring, 1981, pp. 24-28.

Merrifield, P.R., J.P. Guilford, T.R. Christensen and J.W. Frick. "The role of intellectual

factors in problem solving." Psychological Monographs, 1962, 76, No. 10 (Whole No. 529).

Patridge, M.I. and R.D. Tennyson. "Graduate education in instructional systems: a review of selected programs." Journal of Instructional Development, Winter, 1978-79, Vol. 2, No. 2, pp. 18-25.

Rossman, J. The Psychology of the Inventor. Washington, D.C.: Inventors Publishing Company, 1931.

Silber, K.H. "Theories of educational technology." Unpublished paper. Park Forest South, Illinois: Governors State University, May, 1974.

Silber, K.H. "Professionalizing instructional development." Audiovisual Instruction, Vol. 22, No. 8, September, 1977, pp. 52-53.

Silber, K. H. "The need for the study of approaches to training instructional developers." AERA Symposium "Training Instructional Developers," AERA Convention, 1980.

Tobin, K.G. and W. Capie. "The development and validation of a group test of logical thinking." Paper presented at AERA Convention, 1980b.

Wallington, C.J. Personal Communication, May, 1980.

Wallington, C.J. "Generic skills of an instructional developer." Journal of Instructional Development, Vol. 4, No. 3, Spring, 1981, pp. 28-33.

Woodward, A., K. Silber, and M. Jahn. "An investigation of the relationship between Piagetian Stage and achievement and reported satisfaction in courses involving problem-solving ability." Eastern Educational Research Association Convention paper, 1981.